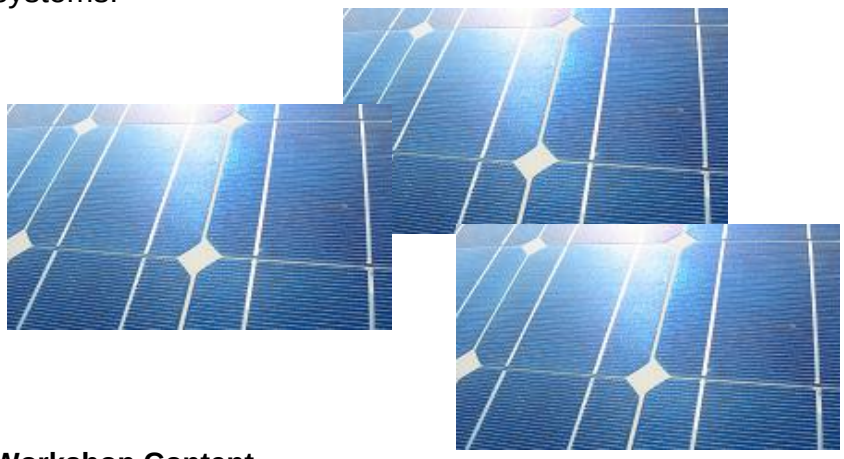
National Electric Code (NEC) Compliance for Photovoltaic Systems

About the Workshop

As photovoltaics (PV) continue to grow in popularity, an increasing number of contractors and specialists have incorporated PV into their projects. PV system has its unique set of code compliance issues. This training provides an overview of small-scale solar electrical generation, and the National Electrical Code (NEC) regulations for installation and safe operation of PV systems.

RENEWABLE ENERGY PROGRAM
CALIFORNIA ENERGY COMMISSION

KEMA



Who Should Attend?
Building officials, inspectors, plan checkers, solar installers, electricians, building contractors, and engineers.

Why You Should Attend?
To learn about NEC compliance issues for PV installations

When?
December 7, 2005 (Wednesday)
9 am – 5 pm. Registration opens at 8:30 am

Where?
Great Valley Center, Community Room
201 Needham Street, Modesto, CA

Cost? $30

RSVP by December 2 Space is limited!

Questions? Contact Nellie Tong
KEMA Inc, Technical Consultant for CEC Renewable Energy Program
(510) 891-0446
nellie.tong@kema.com

Workshop Content

- PV in NEC
- Key 2005 NEC Article 690 changes
- Permit Guidelines for Small-Scale PV Systems
- Inspection Guidelines for all PV Systems

[Please find our detailed agenda attached]

Bill Brooks, Trainer

Bill Brooks has been designing, installing, analyzing, and testing utility-interconnected PV systems since 1988. Over the past 7 years, Mr. Brooks' training has helped over 1,200 inspectors and over 2,500 electricians and installers understand the design and installation of code-compliant systems. His field troubleshooting techniques have been invaluable to attendees. Mr. Brooks holds Bachelor and Master of Science Degrees in Mechanical Engineering from North Carolina State University, is a Registered Professional Engineer in both North Carolina and California, and is the author of several technical manuals for the industry.

Please fax your registration form to (510) 891 0440

or e-mail it to renewables@kema.com

For information on future workshops, please visit http://websafe.kemainc.com/ProjectCenter/cec

Supporting the economic, social and environmental well-being of California's Central Valley.

201 Needham Street
Modesto, CA 95354
Phone: (209) 522-5103
Fax: (209) 522-5116
www.greatvalley.org

MEMORANDUM

DATE: October 31, 2003

TO: Event Attendees

FROM: Heidi Arno

RE: Directions and Parking

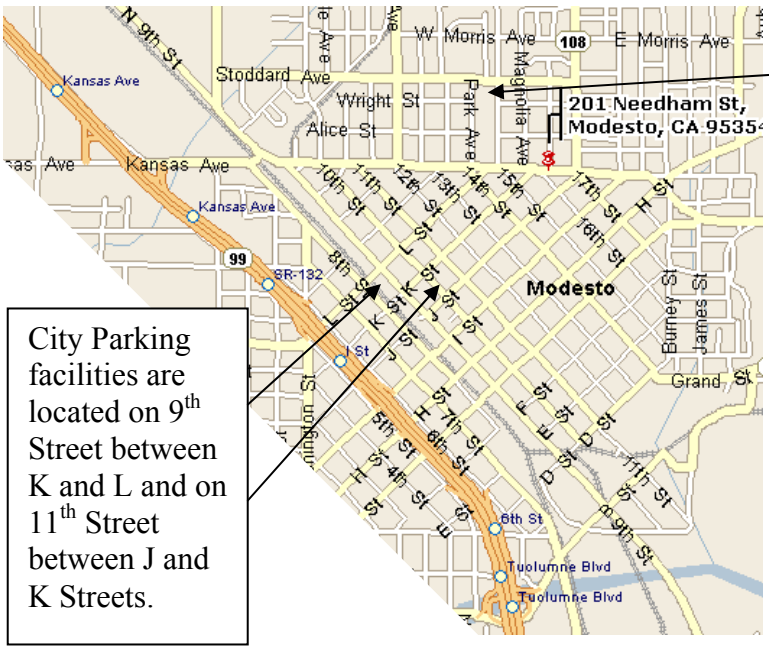
DRIVING DIRECTIONS

From Hwy 99, take **Central Modesto** exit. Turn East on I Street. Left on 9th Street. Right on K Street and Right onto Needham. GVC is located at the corner of Needham and Elmwood.

WEEKDAY PARKING

GVC tries to minimize the impact of our facility on the residential neighborhoods adjacent to our site by asking those using our facility to refrain from parking in front of the residences around our building. Please be respectful of the neighborhood by abiding by the parking suggestions.

There is free public parking adjacent to **Graceada Park** on the west side of Sycamore Avenue and the east side of Park Avenue, two blocks west of the Great Valley center. The City of Modesto operates two lots in the downtown area, one on **9th Street between L and K** and the other on **11th Street between K and J**.



Parking is available at Graceada Park, on the west side of Sycamore Avenue and the east side of Park Avenue.

City Parking facilities are located on 9th Street between K and L and on 11th Street between J and K Streets.

Detailed Agenda
for the
National Electrical Code (*NEC*) Compliance for PV Systems Workshop

in the *NEC*

2. Key 2005 *NEC* Article 690 code changes that impact 2002 *NEC* interpretation
   - 2.1. Article 690.13 and 690.14 Disconnecting Means—clarification on location
   - 2.2. Article 690.35 Ungrounded Photovoltaic Power Systems (690.41 Exception for consistency)
   - 2.3. Article 690.64 options for connecting to an electrical service
     - 2.3.1. (B) (5) no clamping for 690.60 inverters
3. Permit and Inspector Guidelines
   - 3.1. Permit Guidelines for Small-Scale PV Systems
     - 3.1.1. Basic site diagram identifying location of major components—not to scale.
     - 3.1.2. One-line electric diagram showing all major field-installed electrical components, wire identification and sizing, and grounding.
     - 3.1.3. Major component information (inverter, module, batteries)
     - 3.1.4. Array information
       - 3.1.4.1. Array configuration
       - 3.1.4.2. Electrical parameters
     - 3.1.5. Wiring and Overcurrent Protection
       - 3.1.5.1. Wire Type and Conductor Ampacity
     - 3.1.6. Provisions for the PV power source disconnecting means:
     - 3.1.7. Grounding (equipment and system grounding)
     - 3.1.8. Array Mounting information
     - 3.1.9. Costs of Permits
   - 3.2. Inspection Guidelines for all PV systems
     - 3.2.1. Equipment, conduit, and wiring installed according to approved plans.
       - 3.2.1.1. PV module model number matches plans and cut sheets.
       - 3.2.1.2. PV modules are properly grounded
       - 3.2.1.3. Check that wiring is consistent with callouts on plans (number of modules)
       - 3.2.1.4. Check that cable and conduit is properly supported
       - 3.2.1.5. Where plug connectors are used for module wiring, inspect a sample of the connections to make sure that connectors are fully engaged
     - 3.2.2. Structure attached according to plans and directions.
     - 3.2.3. Appropriate signs installed.
       - 3.2.3.1. Sign construction
       - 3.2.3.2. Provide a sign identifying DC power system attributes at DC disconnect

3.2.3.3. Provide a sign identifying AC point of connection
3.2.3.4. Check that label on inverter matches callouts on one-line diagram.
3.2.3.5. Provide a sign identifying switch for alternative power system.
3.2.3.6. If system includes an Optional Standby System, provide a sign at the main service disconnect [702.8] notifying the type and location of the optional standby system.

Registration Form

Course Title: NEC Compliance for PV Workshop
Date: December 7, 2005
This registration form can be downloaded at http://websafe.kemainc.com/ProjectCenter/cec

Please send a $30 check payable to KEMA Inc to the following address:
PV Workshops
492 Ninth Street, Suite 220
Oakland, CA 94607

Name:
Company:
Phone number:
Email:

How have you been involved with PV? (eg. inspector, installer, educator, retailer, sales…)

Approximately how many years of PV experience do you have?
Approximately how many systems have you installed or inspected?
Approximately how many people/customers do you talk to per year about PV?

How did you hear about this workshop?

Please rate your level of understanding for the following topics, with 1 being very little to 5 being expert knowledge:

	Very little……..…….Expert Knowledge				
	1	2	3	4	5
PV installation and design	1	2	3	4	5
Photovoltaics in NEC code	1	2	3	4	5
Key 2005 NEC Article 690 changes	1	2	3	4	5
Permit guidelines for small-scale PV systems	1	2	3	4	5
Inspection guidelines for all PV systems	1	2	3	4	5

To reserve a spot, please submit your registration form to renewables@kema.com or fax to (510) 891 0440. A confirmation will be sent to you once payment is received.

Thank you for registering with us. Please contact Nellie Tong at 510 891 0446 or nellie.tong@us.kema.com if you have any questions.